FIG. 1a
(Prior Art)

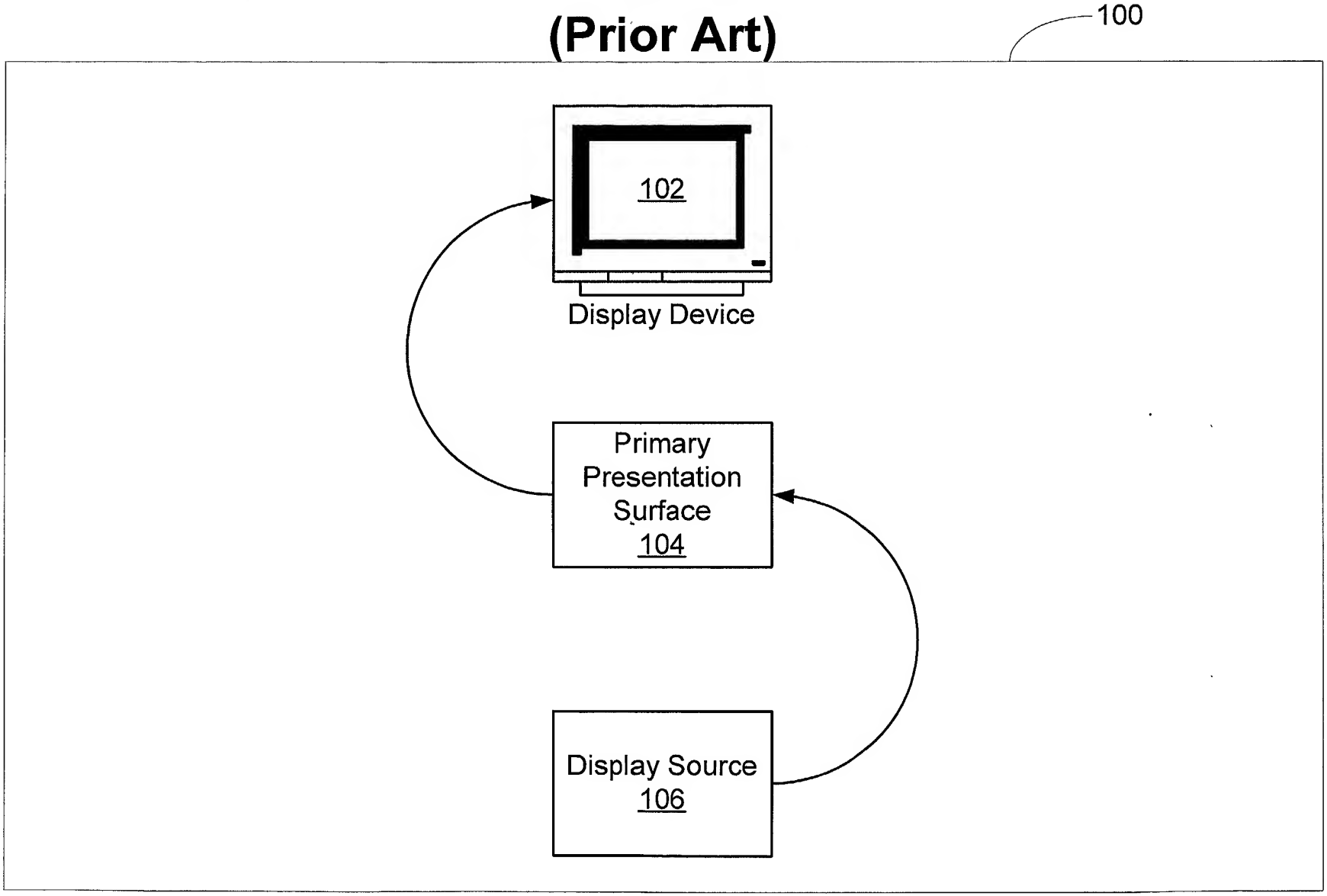


FIG. 1b
(Prior Art)

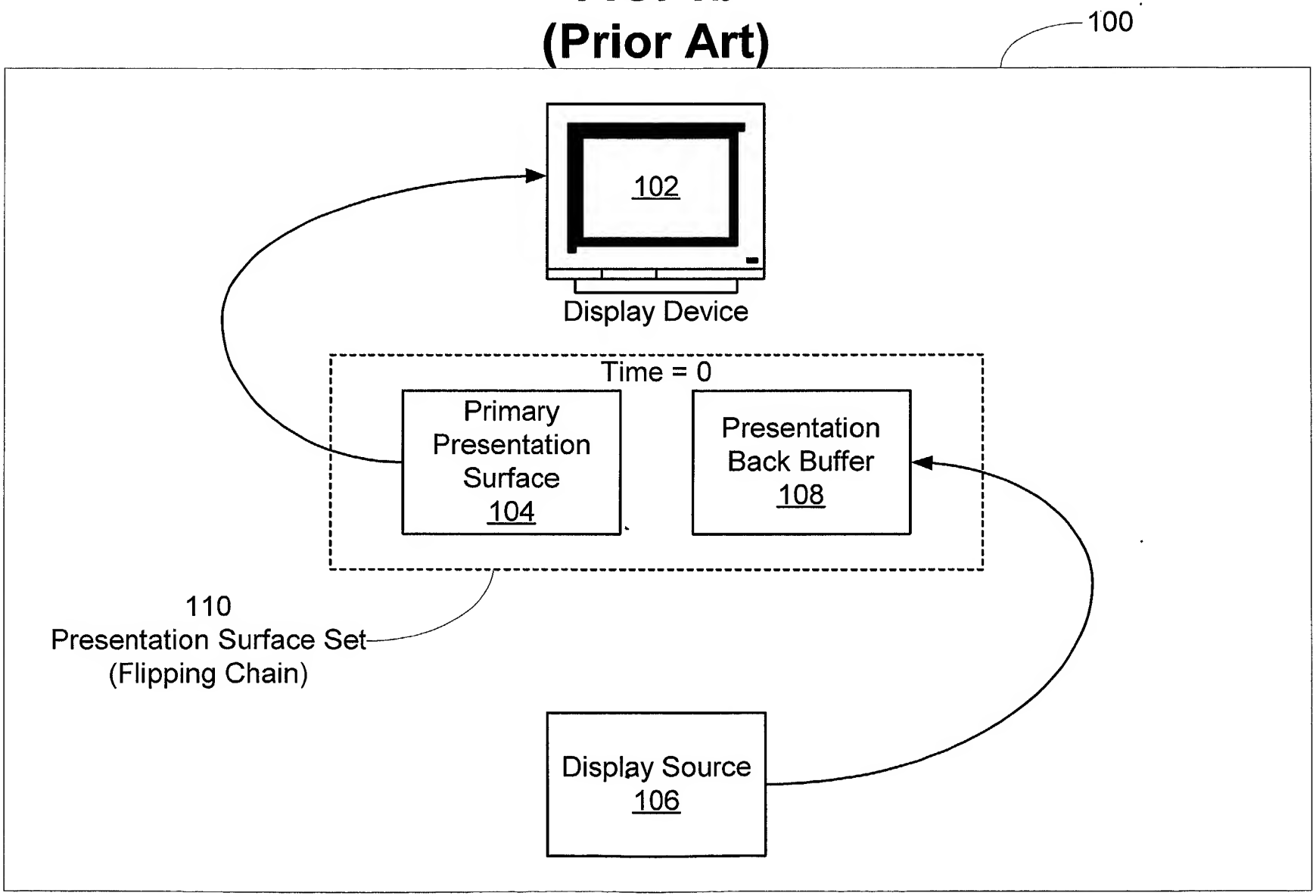


FIG. 1c
(Prior Art)

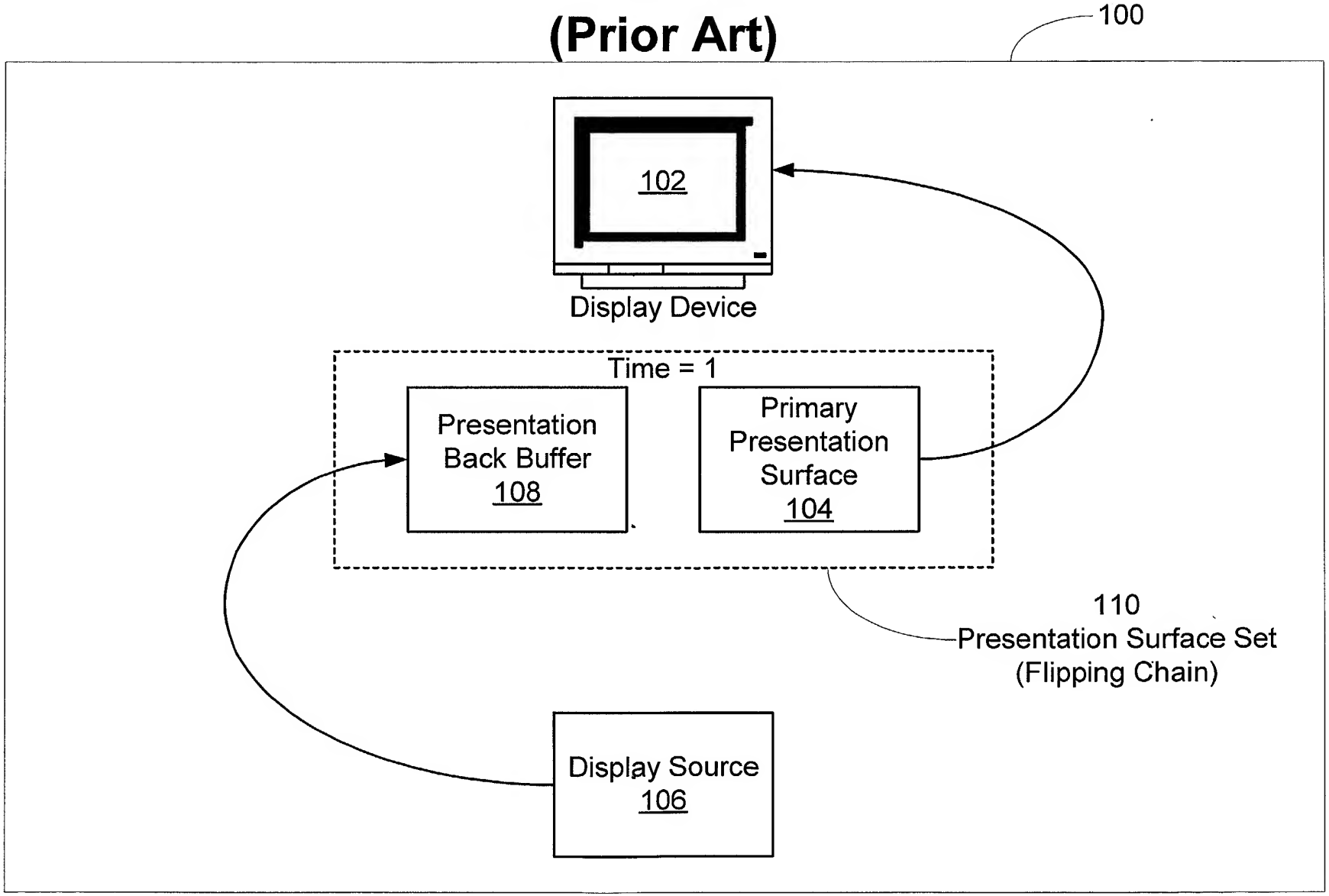


FIG. 1d
(Prior Art)

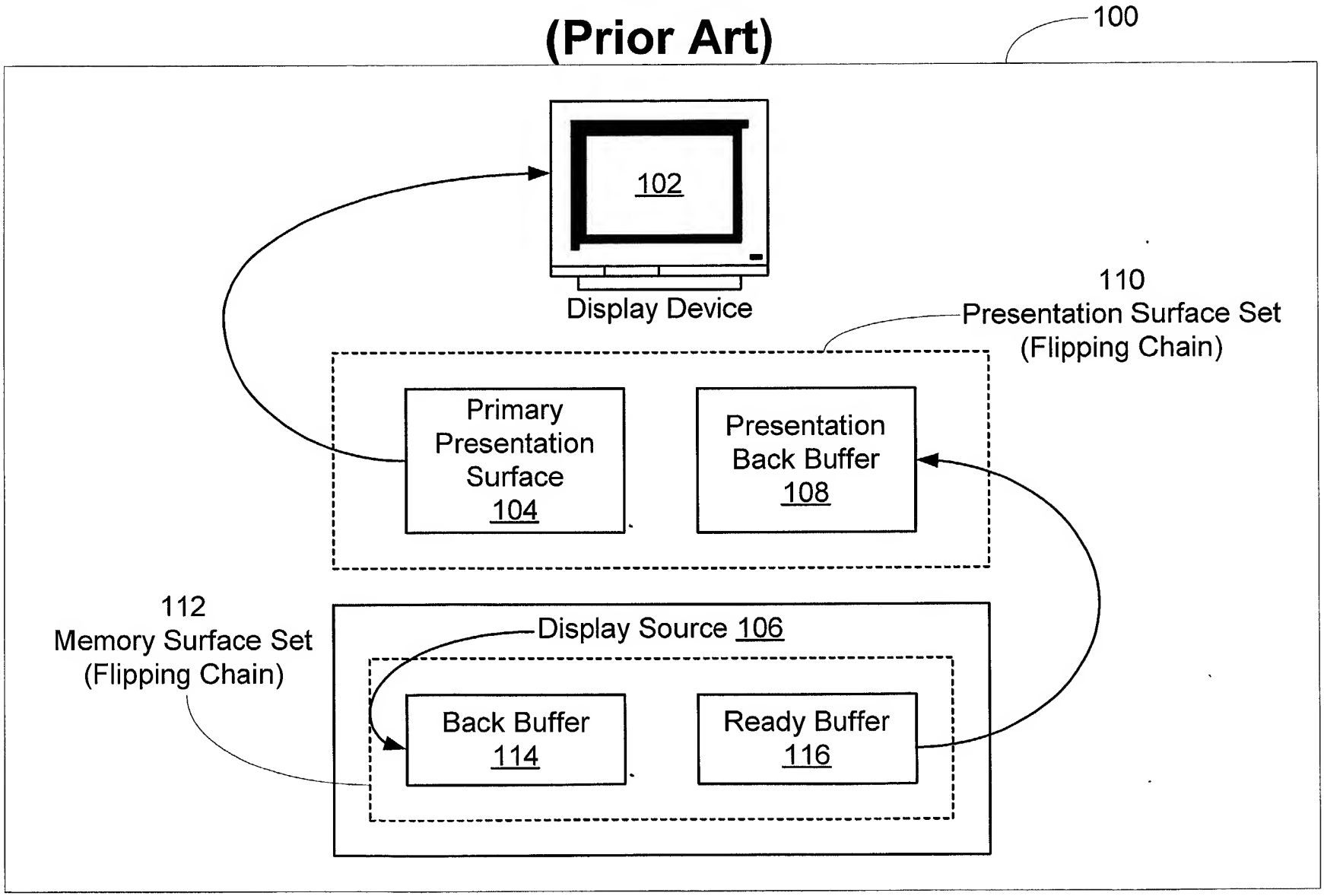


FIG. 1e
(Prior Art)

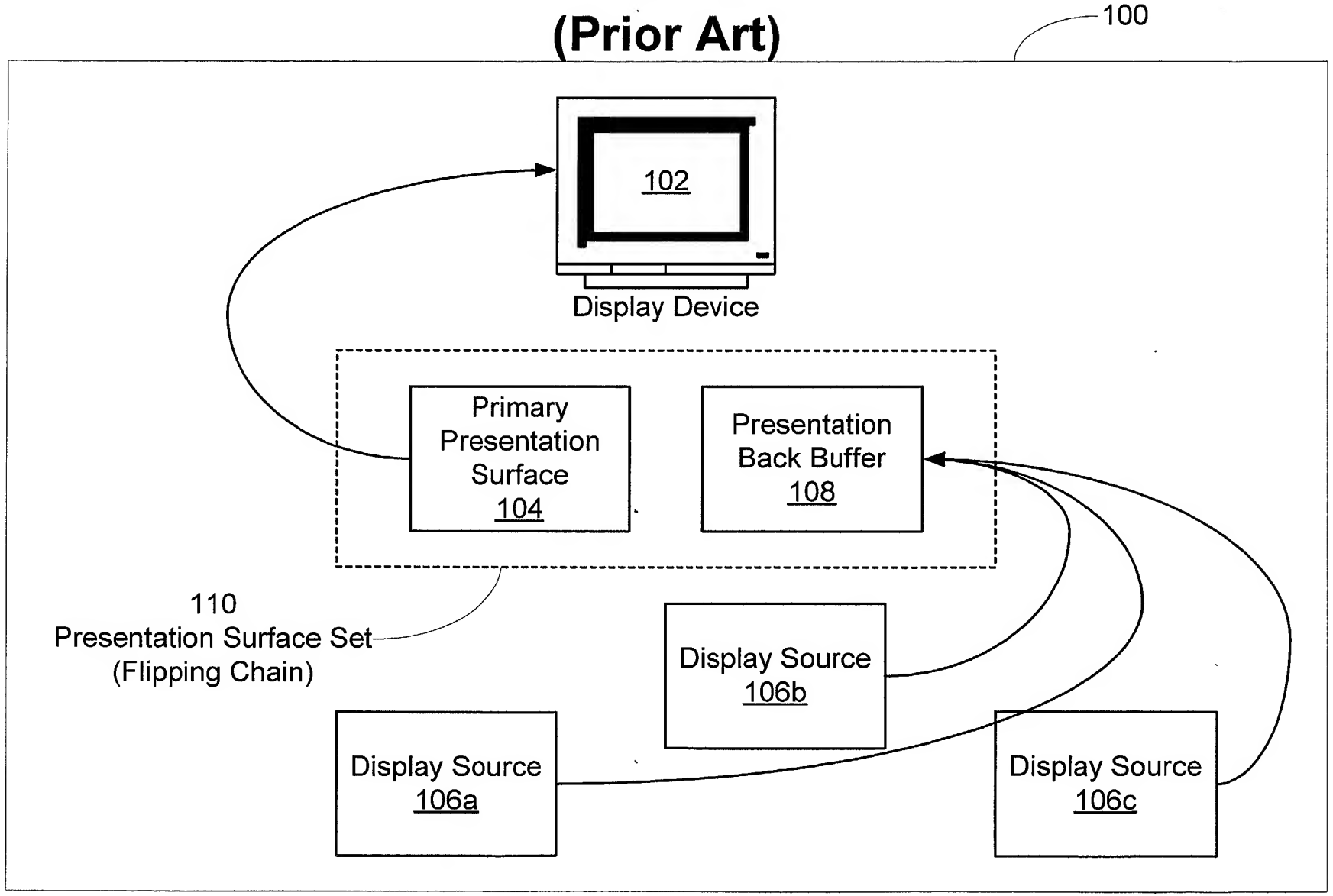


FIG. 2a
(Prior Art)

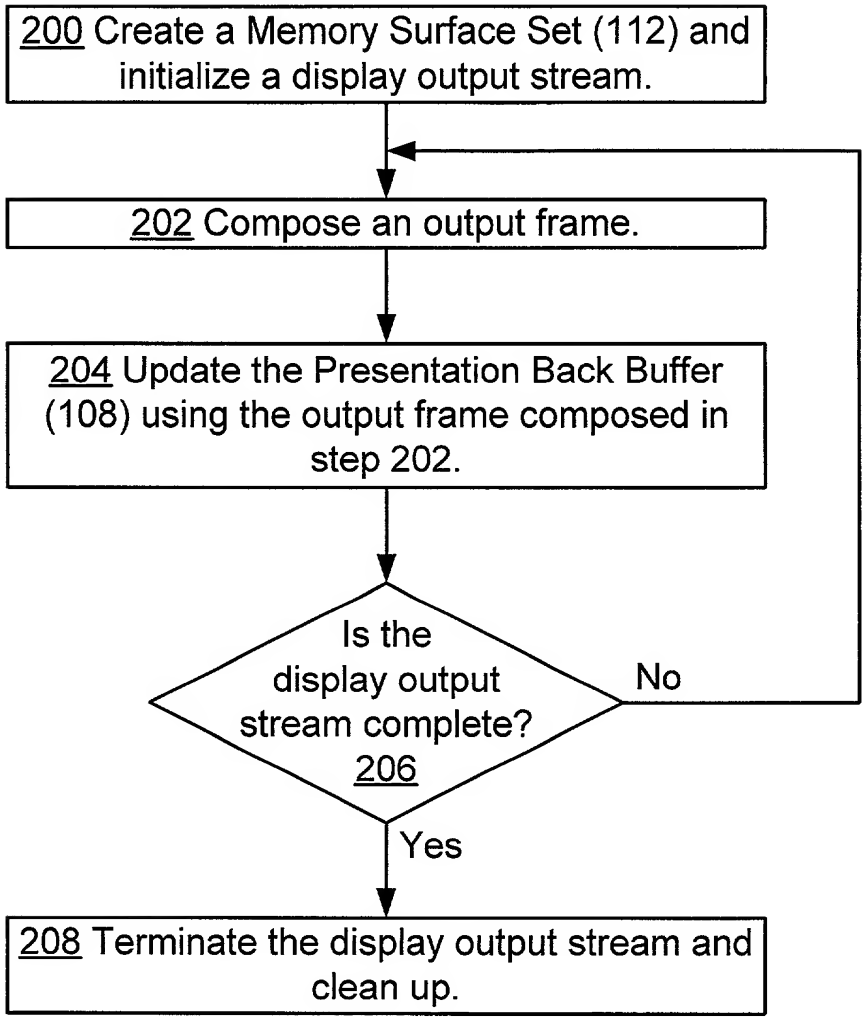


FIG. 2b
(Prior Art)

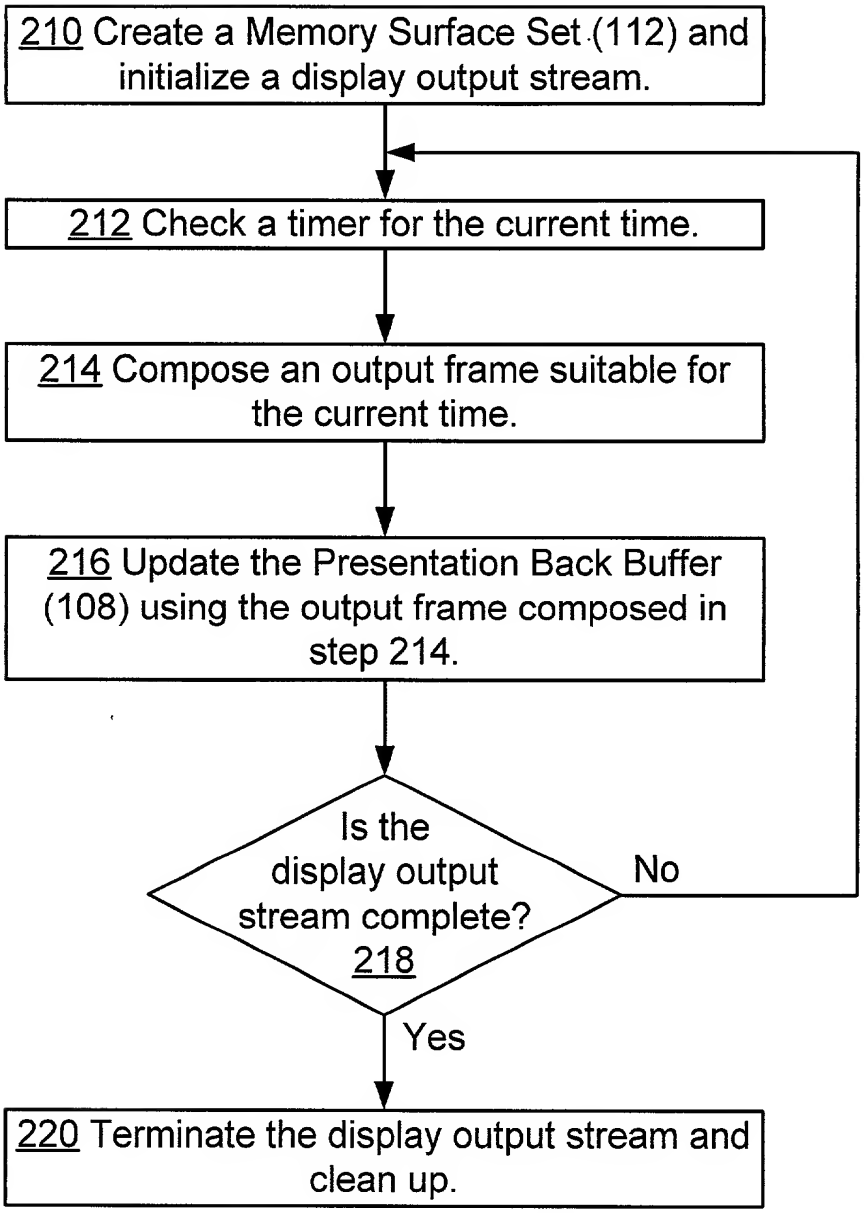
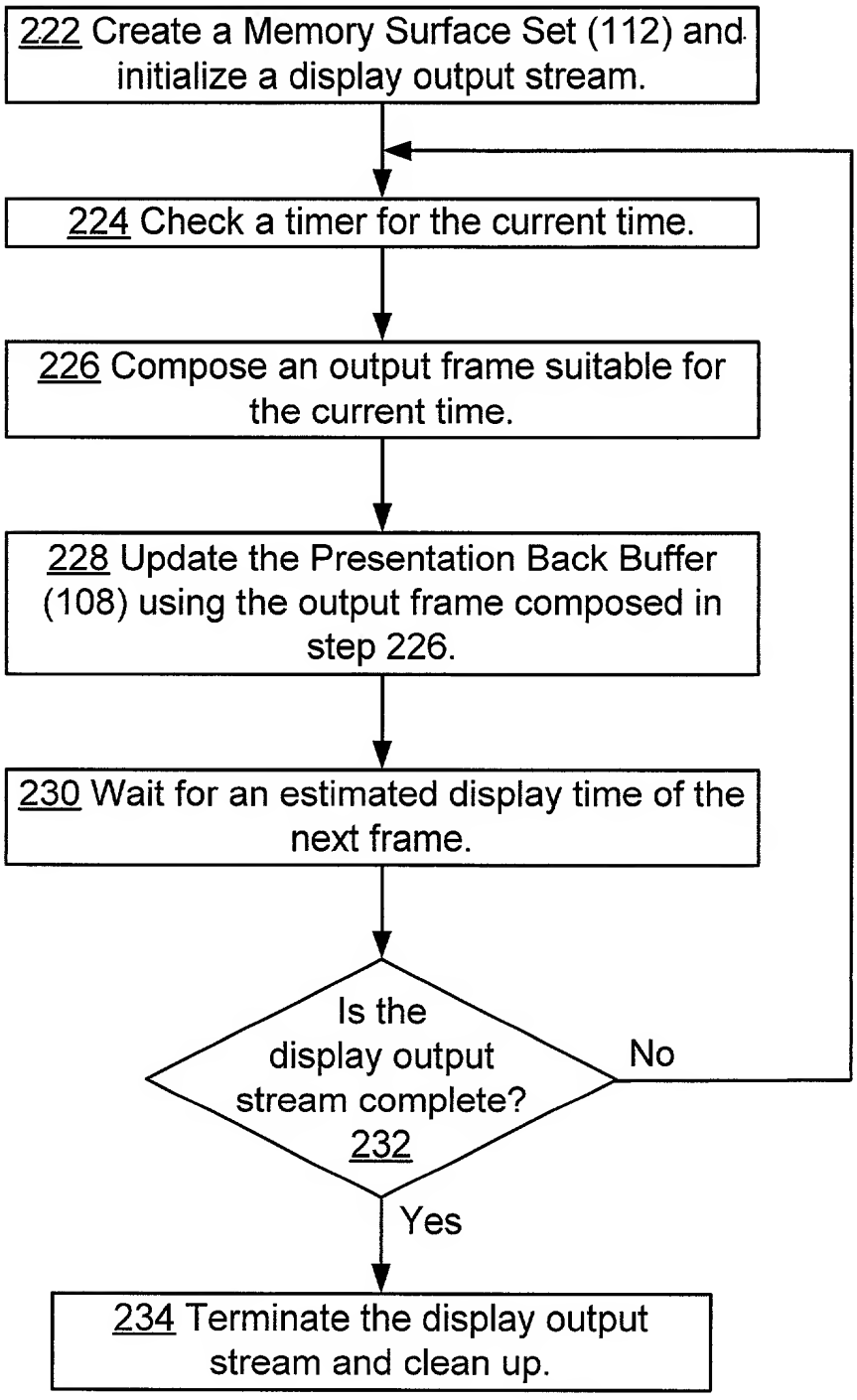


FIG. 2c
(Prior Art)



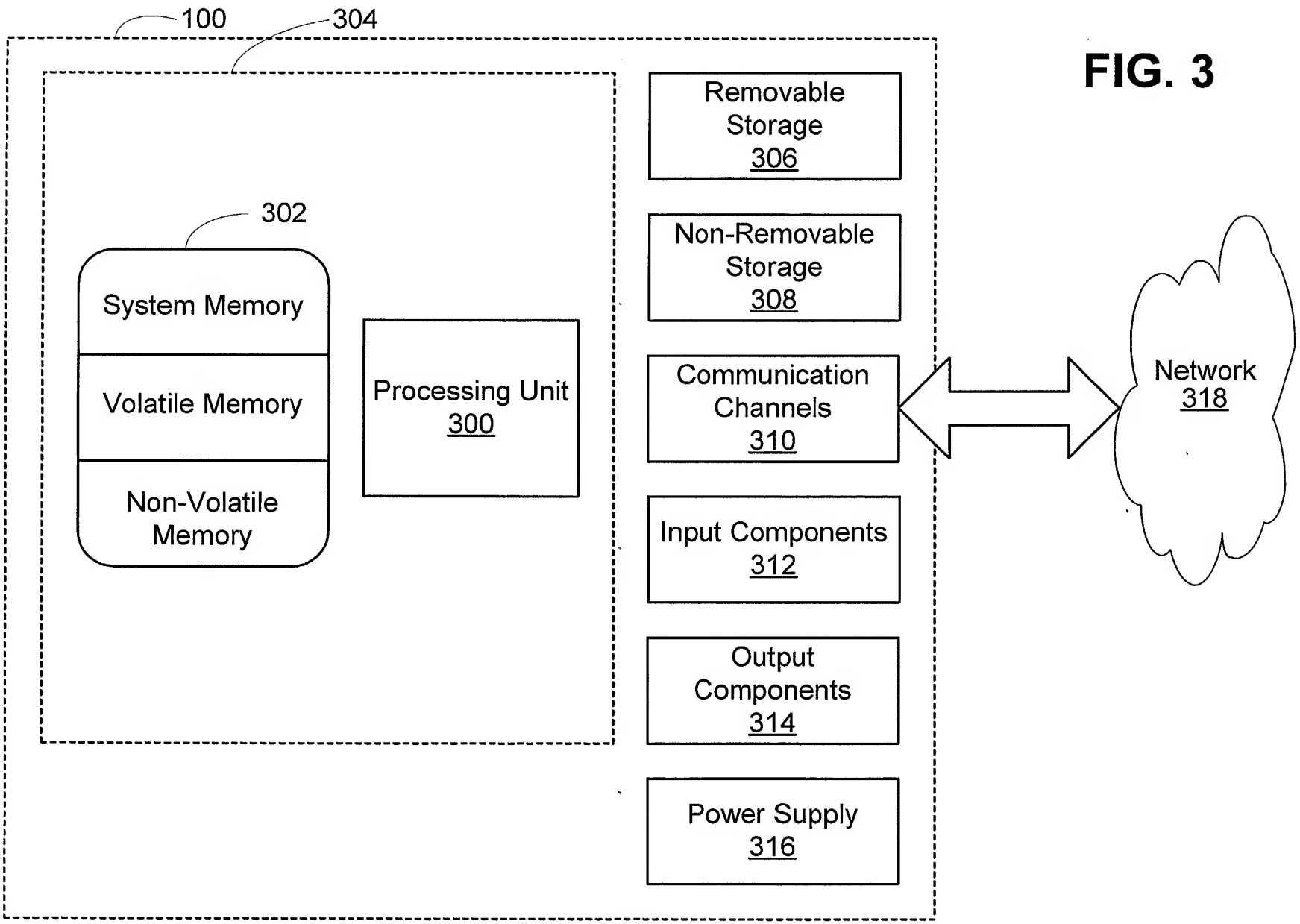

100
304
302
System Memory
Volatile Memory
Non-Volatile Memory
Processing Unit
300
Removable Storage
306
Non-Removable Storage
308
Communication Channels
310
Input Components
312
Output Components
314
Power Supply
316
Network
318

FIG. 3

FIG. 4

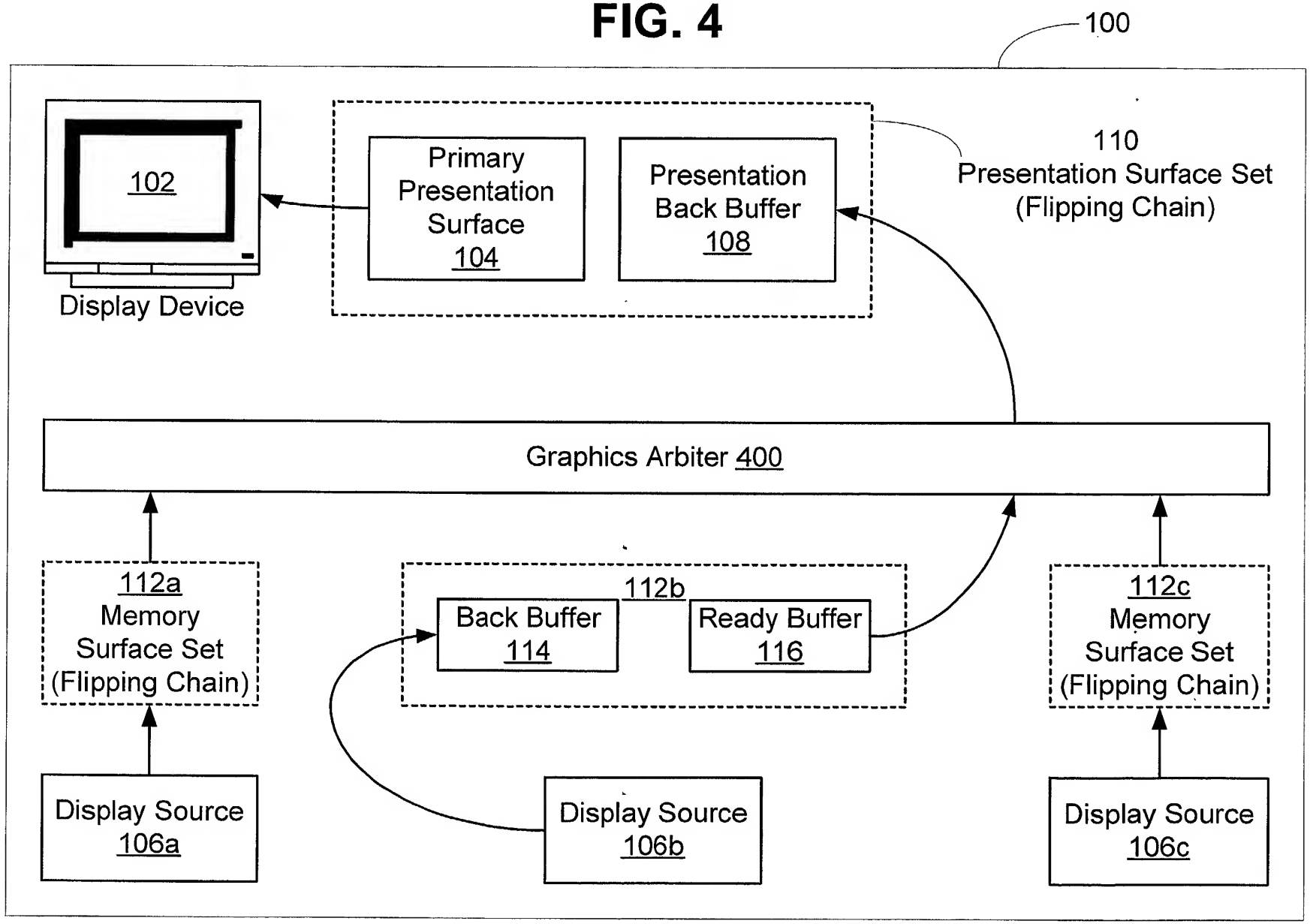

100
102
Display Device
Primary Presentation Surface 104
Presentation Back Buffer 108
110
Presentation Surface Set (Flipping Chain)
Graphics Arbiter 400
112a
Memory Surface Set (Flipping Chain)
Display Source 106a
112b
Back Buffer 114
Ready Buffer 116
Display Source 106b
112c
Memory Surface Set (Flipping Chain)
Display Source 106c

FIG. 5

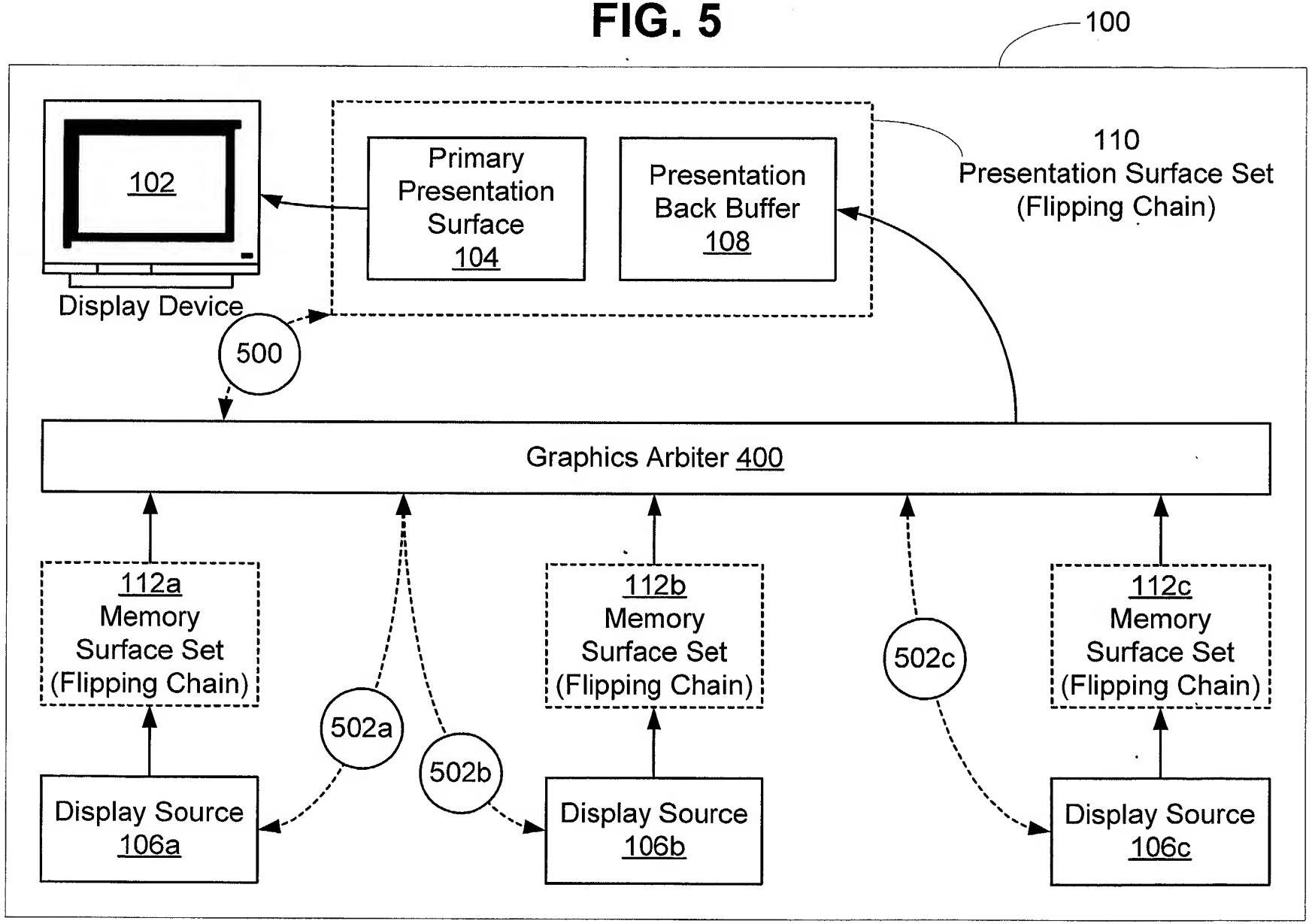

100
102
Display Device
Primary Presentation Surface 104
Presentation Back Buffer 108
110
Presentation Surface Set (Flipping Chain)
500
Graphics Arbiter 400
112a Memory Surface Set (Flipping Chain)
112b Memory Surface Set (Flipping Chain)
112c Memory Surface Set (Flipping Chain)
502a
502b
502c
Display Source 106a
Display Source 106b
Display Source 106c

FIG. 6

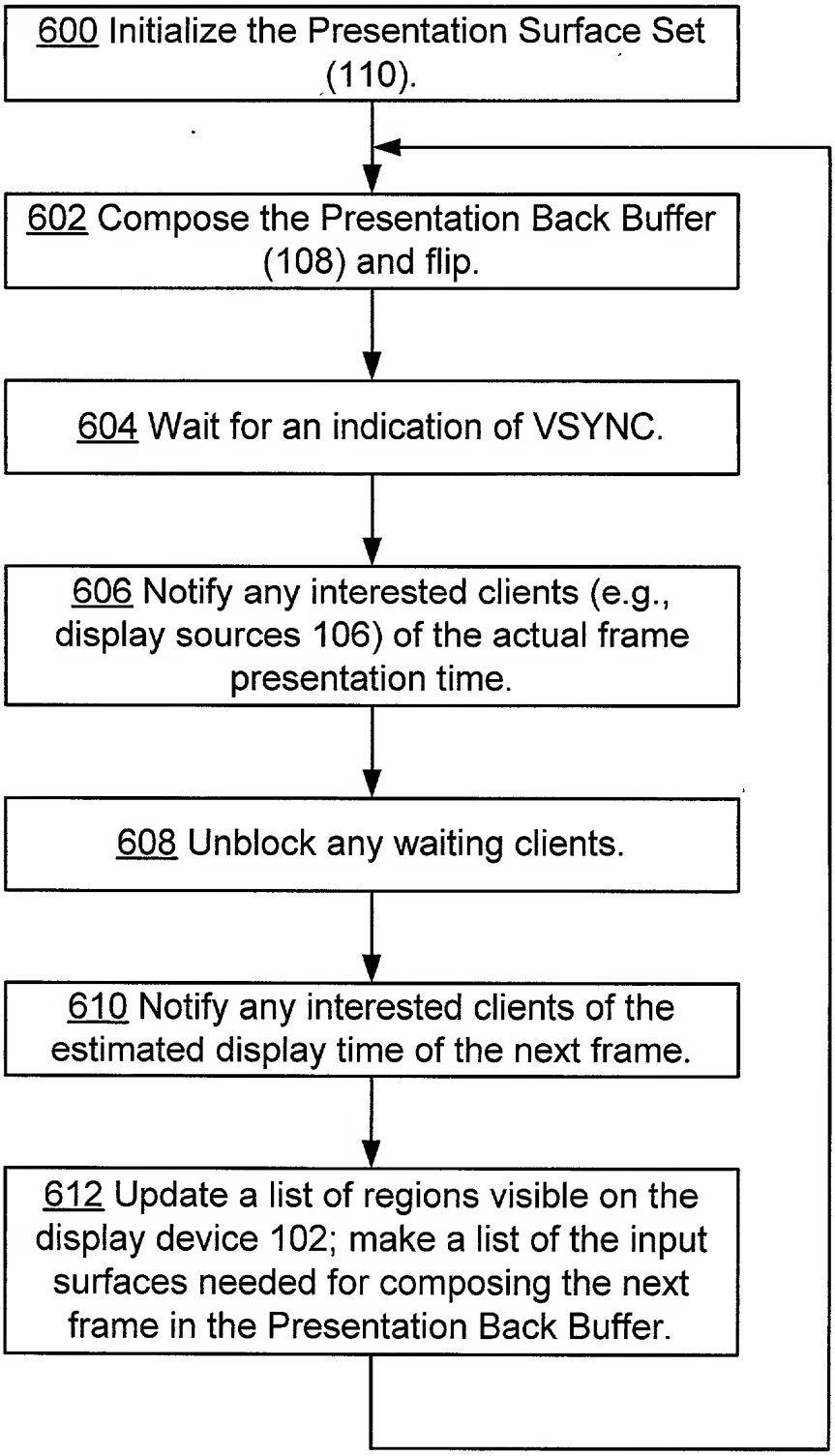

600 Initialize the Presentation Surface Set (110).
602 Compose the Presentation Back Buffer (108) and flip.
604 Wait for an indication of VSYNC.
606 Notify any interested clients (e.g., display sources 106) of the actual frame presentation time.
608 Unblock any waiting clients.
610 Notify any interested clients of the estimated display time of the next frame.
612 Update a list of regions visible on the display device 102; make a list of the input surfaces needed for composing the next frame in the Presentation Back Buffer.

FIG. 7a

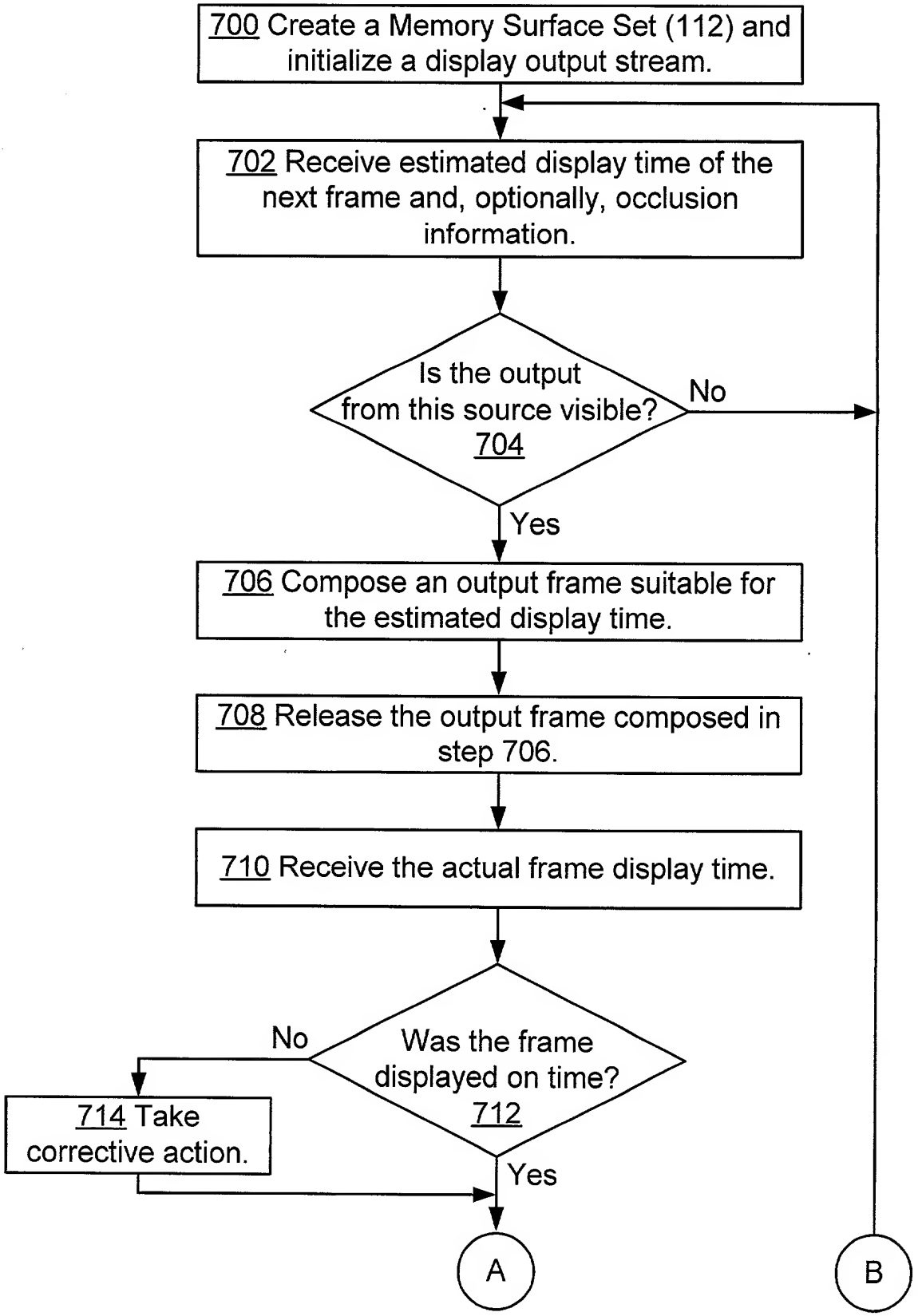

700 Create a Memory Surface Set (112) and initialize a display output stream.
702 Receive estimated display time of the next frame and, optionally, occlusion information.
Is the output from this source visible? 704
No
Yes
706 Compose an output frame suitable for the estimated display time.
708 Release the output frame composed in step 706.
710 Receive the actual frame display time.
Was the frame displayed on time? 712
No
714 Take corrective action.
Yes
A
B

FIG. 7b

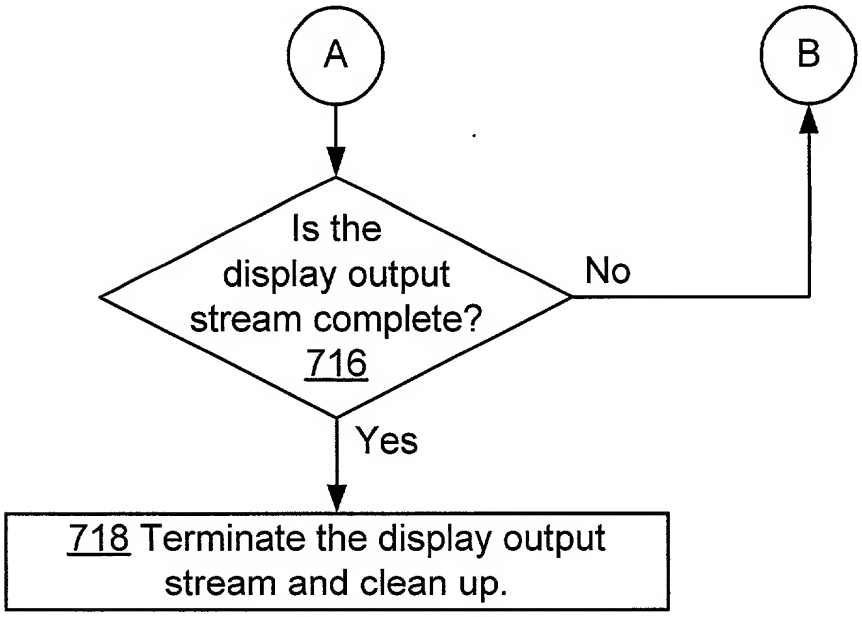

A
B
Is the display output stream complete? 716
No
Yes
718 Terminate the display output stream and clean up.

FIG. 8

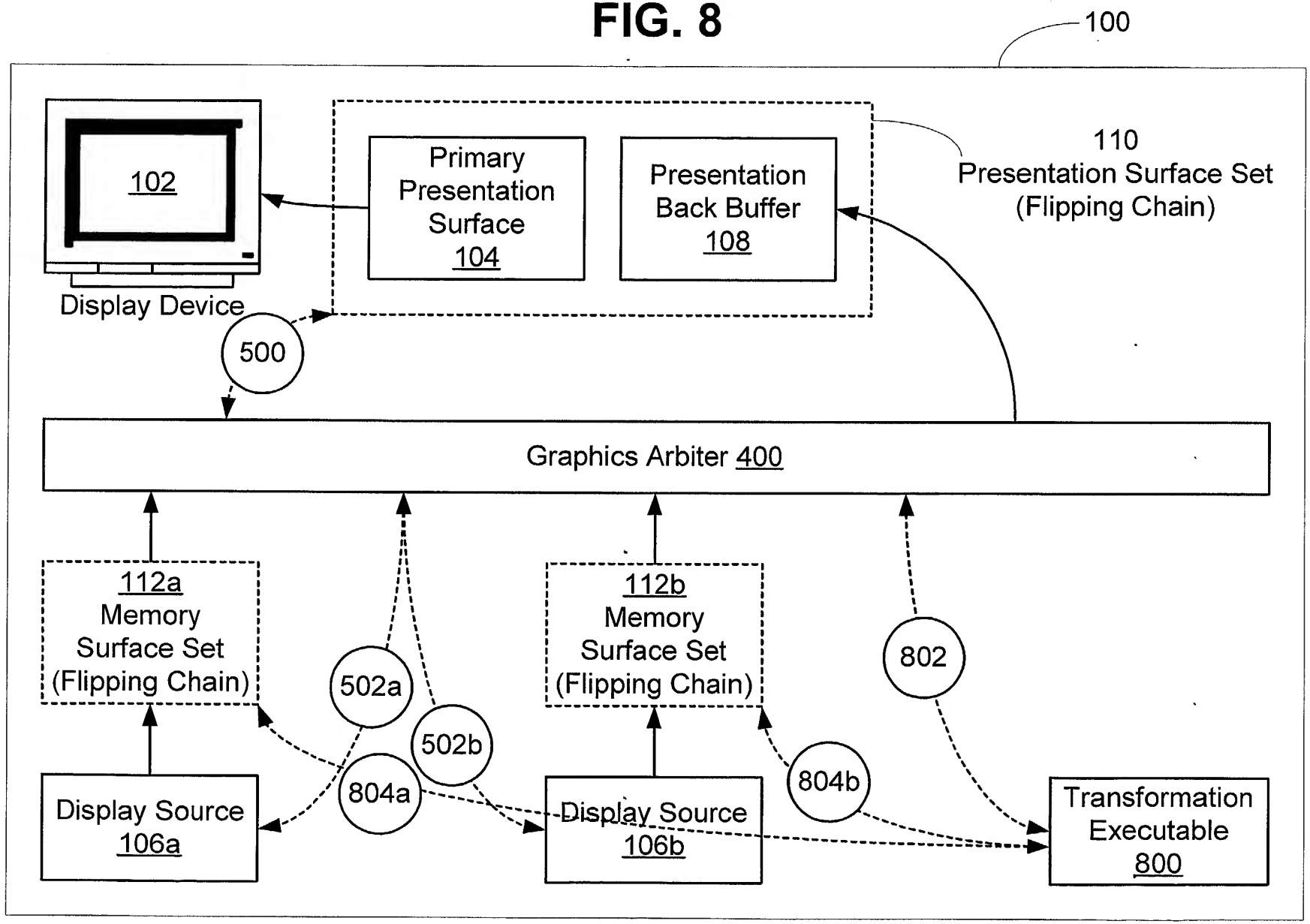

100
102
Display Device
Primary Presentation Surface 104
Presentation Back Buffer 108
110
Presentation Surface Set (Flipping Chain)
500
Graphics Arbiter 400
112a Memory Surface Set (Flipping Chain)
112b Memory Surface Set (Flipping Chain)
502a
502b
802
804a
804b
Display Source 106a
Display Source 106b
Transformation Executable 800

FIG. 9

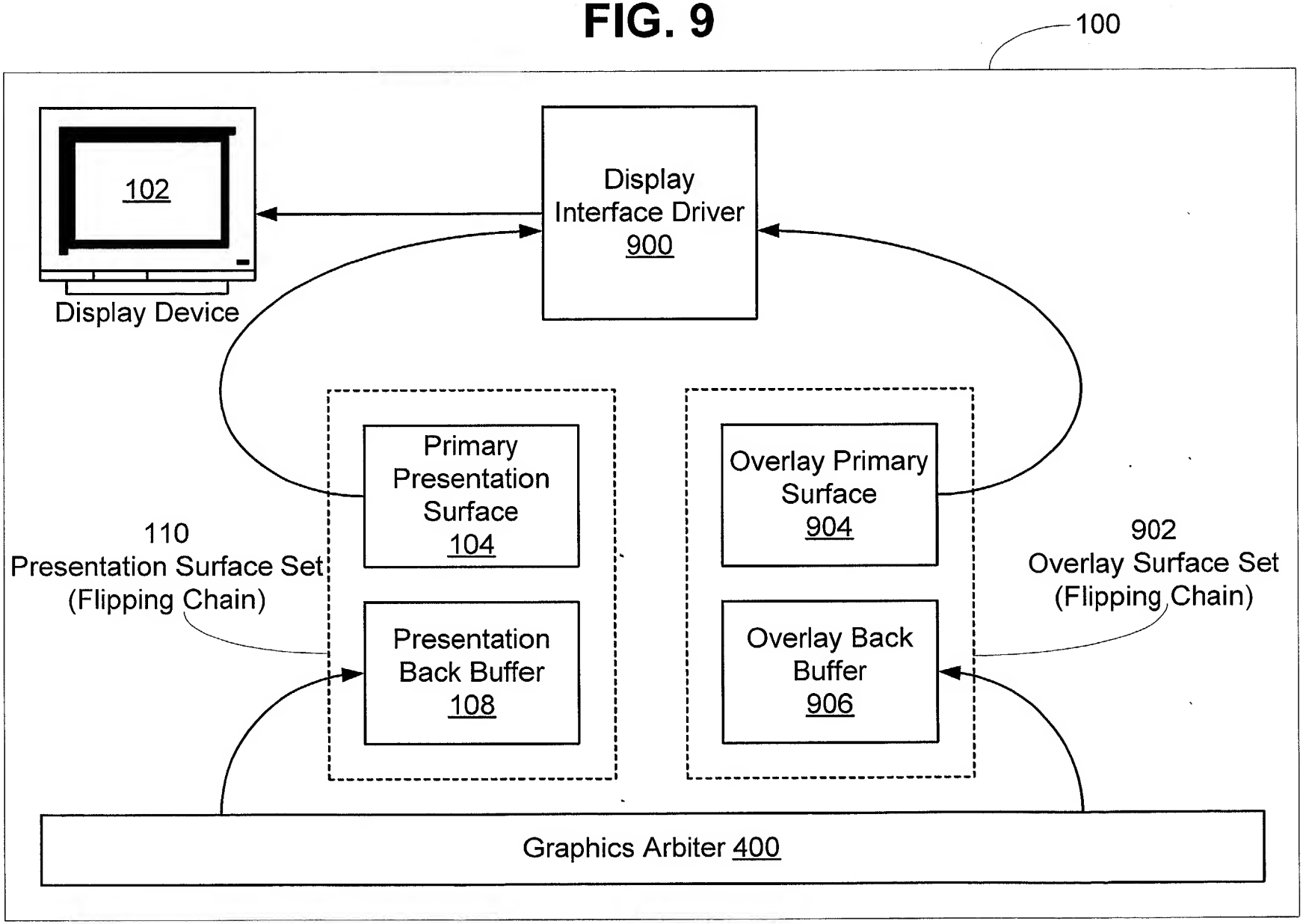

100
102
Display Device
Display Interface Driver 900
Primary Presentation Surface 104
Overlay Primary Surface 904
110 Presentation Surface Set (Flipping Chain)
902 Overlay Surface Set (Flipping Chain)
Presentation Back Buffer 108
Overlay Back Buffer 906
Graphics Arbiter 400

FIG. 10

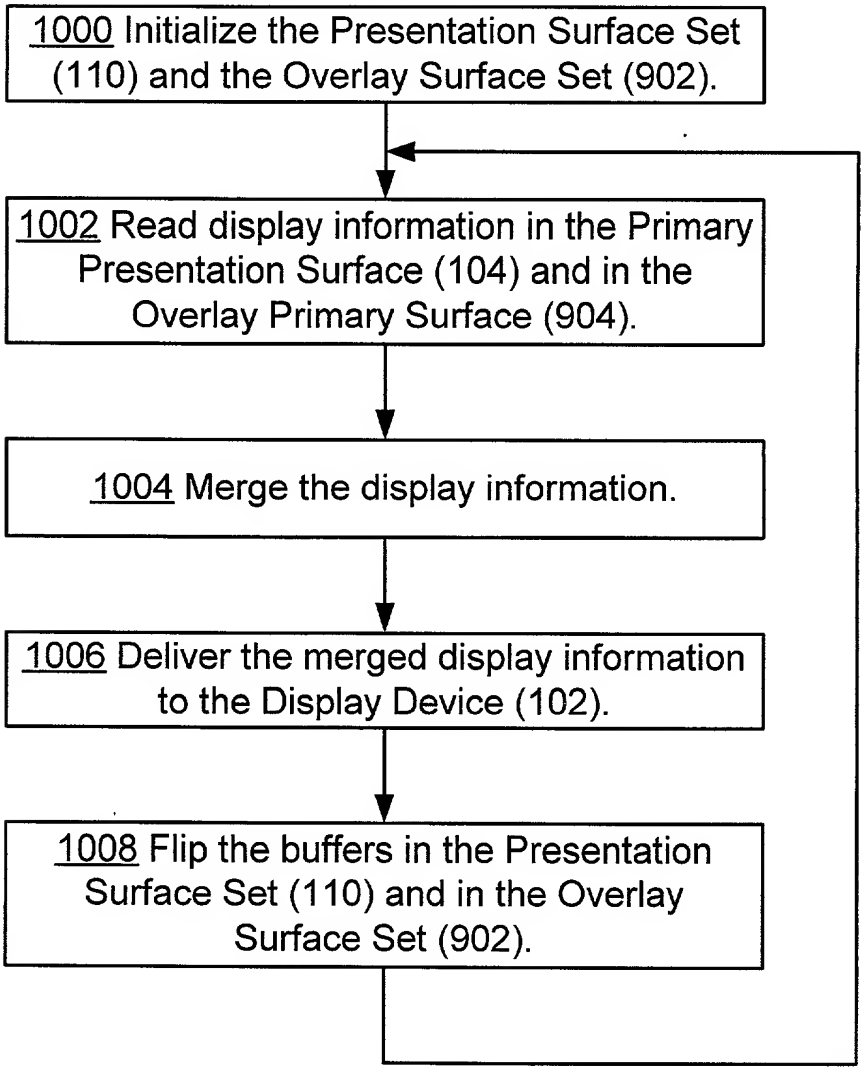
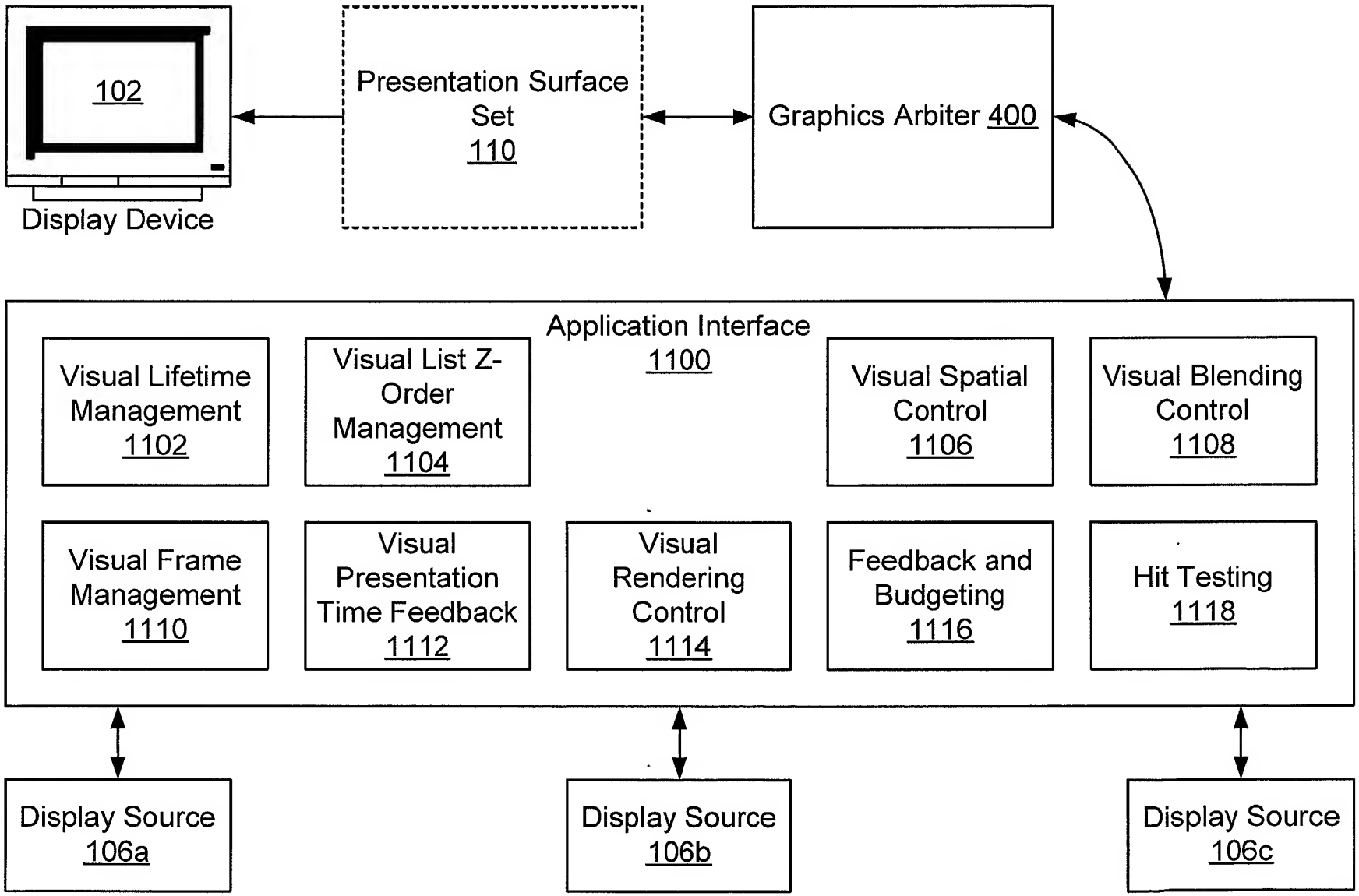

1000 Initialize the Presentation Surface Set (110) and the Overlay Surface Set (902).
1002 Read display information in the Primary Presentation Surface (104) and in the Overlay Primary Surface (904).
1004 Merge the display information.
1006 Deliver the merged display information to the Display Device (102).
1008 Flip the buffers in the Presentation Surface Set (110) and in the Overlay Surface Set (902).

FIG. 11


102
Display Device
Presentation Surface Set 110
Graphics Arbiter 400
Application Interface 1100
Visual Lifetime Management 1102
Visual List Z-Order Management 1104
Visual Spatial Control 1106
Visual Blending Control 1108
Visual Frame Management 1110
Visual Presentation Time Feedback 1112
Visual Rendering Control 1114
Feedback and Budgeting 1116
Hit Testing 1118
Display Source 106a
Display Source 106b
Display Source 106c